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ABSTRACT

This paper proposes a broad outline of a variable model of language development and explores several particulars of such a model in the language behavior of four two-year-old children. The process by which information about language is progressively transformed and integrated rather than merely being added together can be seen in the shifting relations between form and function in the vertical levels of language development. At the same time, knowledge of language proceeds horizontally as the child takes in more than one aspect of the linguistic system being learned. Language development is not compartmentalized with respect to comprehension and production or to phonology, lexicon, pragmatics, semantics and syntax. A study of the co-occurring lexicon, discourse and grammatical complexity variables revealed that these factors influence what children are able to say with different effects: either to facilitate or to constrain sentences. More important, however, is the fact that the variables operate at the same time to influence the child's language behavior. These observations lead to the conclusion that varying lengths of a child's sentences appear to be due to the covariance in different aspects of the child's knowledge of language. (AMH)

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AN INTEGRATIVE PERSPECTIVE ON LANGUAGE DEVELOPMENT[1]

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At one time, emphasis in the study of child language was on the spoken word exclusively, and language development was described as the acquisition of the FORM of language. It eventually became apparent at the end of the 1960's that children do not learn form alone; they learn form to represent CONTENT and learning the content of language is as much a part of language development as is learning the form of language. Again in the 1970's there was a change in emphasis--away from matters of form and content in language development and towards the acquisition of language USE. It has been possible, then, for the purposes of research into child language to cut up language into one or another of these three components: form, content, and use, and to cut up the individual components in order to study aspects of form, or aspects of content or aspects of use. But the development of language advances on several fronts at the same time, and it is necessary every now and then to reconsider that, for the child, the three components of language form, language content and language use come together in the process of language learning. Children acquire language form as they learn something about the content of language; learning form and content comes about as children learn to use language.

A model of language development that takes these three components into account will specify, first, that learning language is a synergistic process, rather than an additive process--meaning that the child does not acquire the facts of language one at a time, but, instead, learns about different aspects of language together, with continuous transformations as well as additions to knowledge about language in the course of experience. Such a model will also specify that what the child knows at any one time is systematically variable, rather than categorical--meaning that the facts of language do not enter the child's knowledge in an all or nothing way, but, instead, interact and influence one another so as to variously affect language behavior in different ways according to different circumstances. It is the purpose of this paper to propose a broad outline of such a synergistic, variable model of language development, and to explore several particulars of such a model in the language behavior of two-year-old children.[2]

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[2] The variation discussed here is the systematic variation in the behavior of individuals, as described in Bloom (1974) and Bloom, Miller and Hood (1975), in contrast with the inter-subject variation in child language that has been described elsewhere (for example, Bloom, 1970 and 1973, Bloom, Lightbown and Hood, 1975; Clark and Garnica, 1974; Ferguson and Farwell, 1975; and Nelson, 1975).

Language Development is Synergistic, not Additive

The implicit assumption in the study of child language is that the acquisition of language is an additive process--that children learn sounds, and combine sounds into words and combine words in structures; use words and then structures to perform various speech acts; and, more generally, learn to comprehend aspects of language before learning to produce those same aspects. This assumption is made manifest when the results of research are reported as taxonomies of behaviors or as sequences. Thus, the vast literature in child language contains descriptions of the sequence of sound development (e.g., Poole, 1934 and Templin, 1957); the sequence in which grammatical morphemes are acquired (e.g., Brown, 1973; Cazden, 1968 and de Villiers and de Villiers, 1973); the sequence in which children acquire the structures of language (e.g., Bloom, Lightbown and Hood, 1975; Bloom, Miller and Hood, 1975 and Brown and Hanlon, 1970); the sequence in which children learn the semantic features of words (Donaldson and Wales, 1970; Clark, 1973 and 1974) and the sequence of perceptual strategies that children use for processing the meaning of messages (e.g., Bever, 1970 and Slobin, 1973).

However, language development is considerably more complicated than accumulating sounds and semantic features to learn words, or accumulating words to acquire a lexicon, or adding one word to another word to form a sentence, or adding one structure to another to make up a 'grammar'. And, taxonomies of linguistic behaviors can lead to missing the forest for the trees--to overlooking the relatedness and interactions among different aspects of the linguistic system that the child is learning, such as between comprehension and production more generally, and between phonology and lexicon, lexicon and grammar, and semantics and syntax in grammar, in particular.

Language development is synergistic, integrative and multilateral--rather than simply additive, and proceeds vertically, through different 'levels of knowing', as well as horizontally, in that virtually all aspects of the linguistic system the child is learning figure in what he is learning. This is not to say that language development does not proceed sequentially. But children do not add one bit of information about language to another bit of information; rather, there is a progressive transformation of old information in relation to new information.

Vertical Levels in Knowing Language

How information about language is progressively transformed and integrated, rather than being merely added together, can be seen in the shifting relations between form and function in development. The idea is not new--that children know something of the form of language, but have to 'relearn' the form of language when faced with some new information. Roman Jakobson suggested in 1941 that features of the sounds that children babble in their vocalizations in the first year, are then relearned as phonemic contrasts in the second year when they learn words. However, there is now evidence that in addition to phonology in infant vocalization, there are other aspects of communication that present the same phenomenon: speech

perception (Eimas, et. al. 1971; Moffit, 1971; Morse, 1974), suprasegmental intonation (Delack, 1976; Kaplan, 1970; Lewis, 1951 and Morse, 1972), syntax (Bloom, 1973; Dore, Franklin, Miller and Ramer, 1976; Ramer, 1976); and dyadic reciprocity (Bateson, 1975; Stern et. al., 1971, 1975). In each of these domains there is performance with a certain degree of facility from a startlingly early age, as children give early evidence of knowing something about the forms (the sounds, sequences and reciprocity) of language.

However, even though there is wide agreement that infants can discriminate and produce a wide variety of speech behaviors, there is no evidence to conclude that these perception and production behaviors are language behaviors (see Butterfield and Cairns, 1974). Pre-school children who are learning language do not discriminate many of the same phonetic contrasts that young infants have been observed to discriminate. For example, the voiced/voiceless distinction that was discriminated by 1-4 months old infants in the study by Eimas, et. al., is one of the last discriminations made by two-year-old children (Shvachkin, 1973; Garnica, 1973; and Graham and House, 1971). Similarly, as described in Bloom (1973), a 16 months old child was observed who used consistent word order with a neologism "wídə̀," for example, "more wídə̀," "Mama wídə̀," etc., and all such combinations with "wídə̀" occurred with sentence stress. However, another five months passed before this child used grammatical combinations of words and such combinations when they eventually occurred, occurred with suspended stress. Dore, Miller, Franklin and Ramer (1976) observed similar behaviors that they described as "pre-syntactic devices". The perception and production of forms, or behaviors derived from them, do not become functional for the child until they are eventually integrated in a communication paradigm with content and use.

In the infant's first year, or first year and a half he also learns certain facts about objects, that will, ultimately, be transformed to provide the content of language. First of all, there is the information that all objects participate in similar behaviors that involve movement and relative location in space. Cats, cookies, hats, Mommies and bottles come into and out of view, and continue to exist even when they are no longer visible, and when they can no longer be acted upon by the child. At the same time, there is the second kind of information that distinguishes objects from one another--the perceptual features that are invariant among cookies, or hats or bottles, and that differentiate among different objects to define concepts of object classes. In the first two years of life, children learn about objects in general (object permanence), and form mental representations of different object concepts (in terms of perceptual prototypes, schemas, summary representations, etc.), and both kinds of information are represented by the forms in children's early language.

At the same time, in infancy, there is the use of sounds in different contexts, and the participation in reciprocal exchanges that will ultimately be transformed to contribute to knowing how to use language. The sounds and movements that the infant uses for communication are different from the later sounds of language in two important ways. First, they are not, by and large, learned from the environment, rather, they depend upon the child's physiological structures and functions. Second, the sounds and movement the infant makes are not intended to 'stand for' or represent his feelings or his experiences. Rather they are, themselves, an integral part of his experience.

The immediate difference between these early precursors to language and later linguistic behaviors is that the infant becomes conventionalized, that is, he learns the conventional and essentially arbitrary ways in which the community uses such linguistic facts as sound contrasts, ordered elements and intonation contours for the forms of language; such nonlinguistic facts about objects as their permanence and transitivity relations to each other for the content of language; and such social facts about persons as their cooperation and reciprocity for the use of language. The important precursors to language in infancy are progressively transformed with the integration of form, content and use, as the child learns to use the conventional forms of language to represent content for some purpose or use.

Once the child learns something of conventional linguistic forms--words, morphemes and sentence structures--there are different things that need to be learned about how the forms of language function within the system. As an example, there are, at least, these four levels of knowing a word. There is knowing a word in terms of (1) its referential sense--as when the word "box" refers to the object box, the word "Mommy" refers to the object Mommy, and the word "open" refers to the action of opening. There is knowing a word in (2) its extended sense--in terms of reference to not just a particular box, or the opening of only a particular box or only boxes, but in reference also to different boxes in different contexts, or opening doors, jars and windows in addition to boxes, in other contexts. There is knowing a word in (3) its relational sense--in terms of the meaning it assumes in relation to other words. Knowing the word "open" in relation to the word "box" is to know something of the relational meaning between words that refer to an action and an affected object, and, ultimately, to categories of actions, such as open, throw and push in relation to categories of objects, such as doors and jars in addition to boxes. Finally, there is knowing a word in (4) its superordinate semantic sense--knowing that there are semantic categories of words that share some aspect of meaning--such as categories of nouns that refer to things that are perceptually and pragmatically alike (such as coins) or things that can be acted upon in similar ways (such as food or clothing), and categories of verbs that involve action or location or notice or causality etc.

Similarly, there are at least these five levels of knowing semantic-syntactic structure. There is knowing a structure in its (1) referential sense as when a combination of words refers to an event concept such as "Mommy eat raisins," and there is knowing a structure in its (2) extended sense, as when different combinations of words refer to the same event concept, such as "Monny eat raisin," "Baby chew candy," and "Daddy drink milk." There is knowing a structure in its (3) relational sense, when two or more structures are conjoined to represent more than one relational concept--knowing that one structure, such as "Baby(s) candy" or "more raisins," can be subordinated to another structure, for example, "Daddy eat Baby(s) candy" or "Mommy eat more raisins." Eventually there is knowing a structure in its (4) transformational sense, knowing that two or more different structures can be acted upon or transformed by a linguistic rule to produce a sentence structure that is only superficially the same structure in both cases. For example, the different structures "they eat" and "eat raisins" can be transformed into the same surface structure as in the sentences "They are too full to eat" and "Raisins are too hard to

eat." In the first sentence, "They are too full to eat," "they" is related to "eat" to mean "They eat," but in the second sentence, "Raisins are too hard to eat," "raisins" is related to "eat" to mean "eat raisins." Such knowing as has been described so far is tacit and implicit, and such evidence of what children know comes from what children do--from their language behaviors. There is also (5) a level of knowing words or structures in the metalinguistic sense of knowing that you know, so that you can reflect upon, or talk about knowing, for example, the difference between acceptable and unacceptable word order, or that sentences with the same surface structure can have different underlying meanings (see, for example, de Villiers and de Villiers, 1974; Gleitman, Gleitman, and Shipley, 1972). Such levels of knowing as these are only a gross index of vertical development, and within each there are progressions and transformations of knowledge. Thus, what can be presumed for one word or one structure (or even a group of words or a group of structures) at any one level, cannot always be presumed for other words or other structures at the same level.

In sum, the behaviors of saying and responding provide evidence of what children know about language, and of the underlying conceptual structures that contribute to the child's learning language. However, there are different vertical levels in 'knowing' language, and the influence between the forms of language and the ways in which form functions in relation to content and to use shifts in the course of development. It appears that form, content and use are parallel developments in infancy, as infants give some evidence that they can perceive and produce aspects of linguistic form at the same time they are learning about objects and events in the world and learning to reciprocate in interactions with others. When children begin to learn forms to represent or encode the ideas they have about the world, it can be said that form follows function. Subsequently, when children know more about forms, it is often the case that function follows form, as for example, when children first know that there are alternative forms that mean the same thing such as the noun "car" and the pronoun "it," and only then begin to learn the social and linguistic conventions for knowing when to use one or the other form (see Bloom, Lightbown, and Hood, 1975).

Horizontal Language Development

Just as language development proceeds vertically in the sense that there are levels of knowing words and structures, language development also proceeds horizontally, as the child's knowledge of language takes in more than one aspect of the linguistic system he is learning and is not compartmentalized with respect to, for example, comprehension and production, more generally, and phonology, lexicon, pragmatics, semantics, and syntax, in particular.

Phonology and Lexicon. Phonological acquisition and lexical acquisition have been kept strictly separate in traditional accounts of language development. Children's phonology has been described until recently in terms of the sequence of sounds that a child is able to say developmentally, usually as a result of articulation testing beginning at around three years of age. If a child is able to say the sound as it occurs

at the beginning, middle and end of a word, then it is considered that he 'knows' the sound or, alternatively, the distinctive features such as voicing, nasality or friction that the sound shares with other sounds that the child can also say. Until recently, the assumption has been either that children learn one sound at a time, or one feature of several sounds at a time.

Similarly, children's vocabulary has been catalogued as a list of words that a child has been heard to say in some recognizable form--without regard to the extent to which the form of the word 'matches' the adult model. Typically, just the fact that the child has said the word has been taken as evidence that he 'knows' the word so that the word could be included in his vocabulary (see, for example, the early vocabulary studies described by McCarthy, 1954 and, more recently, the study by Nelson, 1973).

In contrast with the idea that children learn phonology by learning one sound at a time, or successive distinctive features of sounds such as voicing, nasality, friction, etc., more recent studies have suggested that children do not learn individual sounds as such--they learn words, and learn sounds according to the strategies or rules they acquire for learning words, for example, Francescato (1968), Ferguson et. al., (1973, 1975), Menn (1971) and Waterson (1971). Thus, the emphasis for phonological learning has passed from the phoneme or speech sound as the unit of analysis, to the particular (distinctive) features of groups of speech sounds as the units of analysis, to the word as the unit of analysis. Menn (1971) stressed the importance of context for learning sounds and suggested that the phonological rules that children learn depend upon the first few words that they attempt to say. According to Ferguson and Farwell: "a phonic core of remembered lexical items and articulations which produce them is the foundation of an individual's phonology, and remains so throughout his entire linguistic lifetime. . . and changes in the phonic core are to be understood and accounted for in terms of (at least) lexical, phonic, and social parameters (1975, p. 437).

The regularities, then, in the ways in which the child attempts to say words in the first few years of language development provide the insight into what he knows about phonology and how he learns the phonology of the adult model. Similarly, the regularities in the child's use of a word in different contexts provides evidence of what he knows about the word--in terms of its phonological structure as well as in terms of its referential function, pragmatic function, and eventually, its semantic functions relative to other words. The first occurrence of a word or a single instance of a word is evidence only that the child has some mental representation of the phonological shape of the word in relation to some aspect of experience. But the word may not occur again for many months, or it may occur frequently. It is the regularities in the use of words in repeated and varied contexts that provide the more important information about the words that a child knows, and about what the child knows about a word.

Lexicon and Pragmatics. The words that children learn differ both in their relative usefulness and underlying conceptualization. A child

who has a vocabulary of 50 words will probably use a small core of these words, maybe eight or ten different words, with great frequency and in many different situations. Another somewhat larger group of words will occur less often but probably at least once a day or every two days, and the remaining words will occur rarely--perhaps only one or two times in several days or weeks. Consider a hypothetical child who knows only three words "Mommy," "this," and "apple." The word "apple" occurs when the child sees apples infrequently in comparison with the many other objects that he sees. One object that he sees very frequently in many situations and in rich and varied relationship to himself is Mommy. Thus, relatively, "Mommy" is a word that can be used in more varied contexts with the frequently appearing object Mommy. The word "this," can be used in reference to a wide variety of objects that includes apples and possibly Mommy and maybe just about anything or anyone else. Thus presented with the words "this," "Mommy," and "apple," the child will learn to use them according to what he knows about the events to which they refer, and how useful they are. The importance attached to the word by others will influence its importance for the child as well, as when children are coaxed to say "Hi" and "Byebye."

The relative usefulness of a word or its pragmatic value will depend upon what the word does for the child in different situations. Relational words and person words can be work-words in a child's early lexicon--the words that are maximally useful for him. Relational words or function words (in contrast with object words) are useful in reference to a great many different objects and events. For example, a child can say "gone," "more," "up," "there," in many different contexts and in reference to many different objects that are there, that are not there or that reappear after they disappear. Similarly, person names, "Mommy," "Daddy," "Baby" occur in relation to many of the same events that many object words and relational words also refer to--events that involve many actions and many objects.

The main point is that children do not learn only phonology, nor do they learn only the pragmatics of language, anymore than they learn only lexical meaning when they learn words. Learning words is synergistic and horizontal, in that children are learning linguistic form, content and use when they learn to say words, and what is learned about one will influence what is learned about the others. At the same time, learning words is synergistic and vertical, in that the words that children learn to say refer to object concepts and to relational concepts in ways that change and that relate eventually to learning the semantic relations between words and early grammar.

Lexicon and Grammar

Certain relational concepts are encoded by particular words, where the meaning of the word itself is the meaning also of the relational concept. For example, such primary relations of an object to itself as its existence, disappearance, or recurrence are encoded by such relational words as "this," "gone," "away," "more," etc. Other relational concepts that children acquire in the second year have to do with relations between different object concepts. The inter-object relational concepts that have to do with action, location and possession can also be coded by particular words, for example, the name of the action, such as "push," "turn," or location, "there," "right here" or possession, "mine" and "my."

There is this important continuity then, between the acquisition of words in the single-word utterance period and the acquisition of grammatical structures. The primary relational concepts of an object to itself and the words "this," "more," etc., and the inter-object relations encoded by the relational words "there," "here," "my," "mine," etc. lead the child to discover one of the basic facts of early syntax as well as of language in general. Relational concepts can be coded by a synthetic process whereby a constant form such as "more," "gone," or "my" is affixed to many different forms such as "meat," "airplane" and "ball," and the result is a relational meaning that derives from the meaning of the constant relational form such as "more" in "more meat" to mean recurrence, "gone" in "airplane gone," to mean disappearance, and "my" in "my ball" to mean possession.

Another way that relational concepts are represented in children's speech in the single-word utterance period is through the use of successive single-words--where each of the words refers to an aspect of an inter-object relation. Thus, the occurrence of successive single-word utterances in reference to relations between objects such as "car. Daddy," as Daddy leaves to get the car, "slipper. Mommy," as a child picks up Mommy's slipper, etc., lead the child to discover a second basic fact of early child syntax and languages in general. Linguistic categories of words can be related to each other through an analytic process, whereby the semantic relation between the words is essentially independent of the lexical meaning of either of the words separately. Thus, children learn that several words, e.g., "Mommy," "Daddy," "Baby," etc. form a linguistic category, because in addition to the meaning that each word has separately, they all mean the same thing in relation to another group of words, e.g., "coat," "glasses," "keys," which, similarly, form another linguistic category. The two categories together yield a semantic relation or relational meaning of, for example, "possession."

There is, then, contact between learning lexical meaning and later grammar as children learn to use single-word utterances, just as there is horizontal learning with contact among phonology, pragmatics, and lexical meaning as children learn words. Similar vertical and horizontal dimensions of learning language occur when children learn syntax and semantics in order to combine words to form sentences.

Syntax and Semantics

There appear to be at least two views of the relation between syntax and semantics in child grammar. There is, on the one hand, the proposal that children learn rules of grammar when they learn to say sentences (Bloom, 1970; Bloom, Lightbown & Hood, 1975; Bloom, Miller & Hood, 1975). In particular, there is a synergism whereby syntax and semantics are integrated in learning grammar, and a progressive transformation of the relation between syntax and semantics with the acquisition of new information about language form, language content and language use. In its broad outline, the proposal is that at least the following three things happen when children learn to say sentences: children (1) learn something about objects and events in the world and form conceptual categories, (2) learn something about sound, words and the relations among words and form linguistic categories, and (3) learn rules of grammar whereby

linguistic categories are formed and ordered in the structure of sentences. This proposal is based upon a definition of grammar to mean a system of rules that relate linguistic elements to one another in regular ways according to the meaning relation between them.

On the other hand, there has been an alternative explanation of children's sentences that appears to have been based on an interpretation of grammar to mean only syntax, rather than both syntax and semantics. According to Antinucci and Parisi (1971, 1973), Bowerman (1973), Braine (1976), Schaerlaekens (1973), Schlesinger (1971), and others, the development of syntax depends upon the prior development of the semantics of sentences, and children's sentences consist only of the semantic relations between words. The question that appears to divide the two views is, at what point does syntax meet semantics: when children learn to combine words, in order to say sentences, or at some later time?

As a theoretical position, a strictly 'semantic theory' of learning to say sentences is the easier position to take, because it stays comfortably close to the actual data of child speech. In contrast, the position that children's early sentences derive from knowledge of the semantic-syntactic relations among words, means that one word, plus another word, is often more than only two words when children say sentences. The implication is that there is a fuller constituent structure than is actually realized in two-word sentences, with the assumption that there is a more abstract level of knowledge underlying the actual data.

The evidence of a more abstract level of grammar is available in children's use of verbs, where one plus one is often more than two. The verbs that children learn are, at once, both the result of their conceptual development--in that children learn those verbs that enable them to talk about what they know about--and the major determinant of the development of grammatical structure. Children do not learn verbs and their relations to nouns one at a time. Rather children learn categories of verbs for saying sentences--several verbs that have the same syntactic-semantic relations to succeeding and preceding nouns (or pronouns) appear at about the same time: among the first semantic-syntactic categories of verbs are locative action verbs, where the location of some object is changed, for example, "put," "go," "sit down," and simple action verbs, where an action affects an object in some way other than to change its location, for example, "eat," "turn," "bang." Within each category of verbs, such as action, or locative action, etc., the meaning of the relation between a verb and a noun can have the same meaning, for example, agent--action or locative action--place, regardless of the individual lexical meaning of the verbs and nouns themselves.

In contrast, there are other relational meanings in early sentences, where a constant function form with specific meaning such as "more," "away," "there," etc. is combined with other words, and the meaning of the function form determines the meaning of the two words in combination. Such word combinations as "more cookie," "more airplane," "more cheese" are simply additive and one plus one does equal two; that is, there is no new meaning other than the cumulative meaning of the two separate words when they are joined together. Moreover, such relational meanings are

separate relations in that they do not share any meaning in relation to one another, or in relation to other phrases that the child uses at the same time. The words that occur in these functional combinations do not themselves form a class or category by virtue of some shared meaning with other words. That is, there is no common meaning among all the words, "this," "there," "more," "no," "gone," etc. that would be a criterion for assuming that they represent a category of words that the child has learned.

In contrast, children's sentences with verbs are not simply additive--that is, the combination of a noun and a verb results in some larger meaning that is more than only the meanings of the separate words. Certain nouns relate to verbs as actors or agents of an action, certain other nouns relate to verbs as objects affected by an action and still other nouns relate to verbs as the place that is the endpoint of some movement that changes the location of an object--in addition to their inherent lexical meaning. Such semantic-syntactic relations between nouns and verbs are not separate relations. The relation between a verb and an agent noun such as "Daddy throw" is also related to the relation between that same verb and the object that is affected by the action, "throw raisin." The relation between the first relation (y), i.e., "Daddy throw" and the second relation (z) i.e., "throw raisin" is the superordinate relation (x), as in Figure 1.

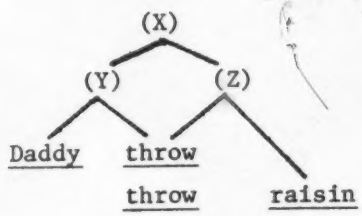

Figure 1. Schematic representation of constituent structure

When categories of verbs such as action or locative-action are formed on the basis of the elements of meaning that they share, and the same relations that they have with categories of nouns or pronouns, then the relation between a verb and an agent noun such as "Daddy throw," is the same as the relation between a different verb from the same category and a different agent noun, such as "Mommy push." The relationship, then, between "Mommy push" and "push swing" is the same superordinate relationship (x) as between "Daddy throw" and "throw raisin." The resulting structure is hierarchical in that the immediate constituents (y) and the immediate constituents (z) are both related, in turn, to the higher order relation (x).

Moreover, the same hierarchical structure exists with different categories of verbs, and, therefore, different semantic-syntactic relations between verbs and nouns that occur before or after the verb. In the study reported in Bloom, Miller & Hood (1975), most of the sentences of the four children--Eric, Gia, Kathryn and Peter--whose language was observed in the period when mean length of utterance increased from about 1.0 to about 3.0 morphemes included locative action verbs where an object was affected by

some movement and changed place. With one category of locative verbs, the object in the sentence entailed an agent, as in "Kathryn put bear right here," and the pre-verb noun was the agent, while the post-verb noun was the affected object. With a second category of verbs, the object was affected by an agent, but the agent relation was not entailed in the sentence, as in "lamb go here" (as Kathryn put the lamb in a block) and such pre-verb affected-objects were patients. With a third category of verbs, the object that was affected by the movement was also the agent of movement, as in "Mommy go outside," and such pre-verb nouns were movers.

The semantic functions of Objects, Movers, and Patients were similar, that is, they were always the object affected by a movement. However, although their semantic function was the same, they differed in their positions relative to verbs: affected-objects were post-verb constituents with Agent-Locative Action verbs, and Movers and Patients were pre-verb constituents with Mover- and Patient-Locative Action verbs. Further, Patients, in Patient-Locative Action utterances, and Objects, in Agent-Locative Action utterances, had essentially the same semantic function: the child (or someone else) was the causative agent in both. Thus, when referring to the same event the children could (and often did) say "put lamb here" and "lamb go here," but they did not say *"go lamb here" or *"lamb put here." It was not clear what the children's semantic understanding of "lamb go here" was, whether they distinguished lamb moving from the lamb being moved. However, even if the children had not yet sorted out the semantic relations, they were quite clear about the syntactic relations of such semantic functions: they consistently put the moving object (Patient or Mover) in pre-verb (Subject) position with certain verbs and in post-verb (Object) position with other verbs. Although the children were learning semantic relations, the fact that words serving the same semantic function varied syntactically in relation to different classes of verbs, was evidence against the claim that sentence relations are only semantic relations.

The constituent structures in such hierarchical syntactic relationships can be called subject and predicate, if "subject" and "predicate" are defined in these terms, or the constituent structures can be called something else. Obviously, the child does not know what the adult knows about sentence subject and predicate, and using the same terms should not imply that they do. Children do not know the transformational rules that operate on subject and predicate constituents in adult grammar, and they do not know the distinctions between underlying structure and surface structure subject/predicate relations. While children do say sentences that have different surface structures but the same underlying meaning with different verbs, as in "lamb go here" and "put lamb here," they do not say either (1) sentences that have different surface structures but the same verb, as in "The girl pulled the wagon," "The wagon was pulled by the girl," "Pulling the wagon was what the girl did," "The girl pulling the wagon is my sister," etc.; nor (2) sentences with the same surface structure and different underlying structure as in "Raisins are too hard to eat," and "They are too full to eat."

While it is true that children's knowledge of subject and predicate is not the same as adult knowledge, neither is it the case that the child's

knowledge is different. That is, the child's early knowledge of the subject/predicate constituents in hierarchical structure is necessary but not sufficient knowledge about sentences. It is the beginning of the plan or scheme whereby sentences are created with the semantic relations that were formerly represented in successive single-word utterances, and the rest of language development consists of vertical and horizontal progress towards filling in everything else that one needs to know of the linguistic scheme. Smith (1975, pp. 313-314) suggested "that young children have a general notion of subject and other grammatical relations that corresponds more or less to the traditional notions of subject, etc. . . . /and/ may follow general rather than specific principles, especially with respect to word order . . . /and/ only gradually differentiate between different types of relations" in moving developmentally from the general to the particular linguistic categories in the acquisition of grammar.

Regardless of which of the two views of early sentences, semantic or semantic-syntactic, one holds, everyone appears to agree that, in order to learn to say sentences:

(A) children learn semantic relations between words, and

(B) children learn rules that enable them to produce combinations of words with semantic relations between them.

Schlesinger (1971) proposed that these latter (B) rules that children learn are "realization rules" that map underlying semantic structures onto the surface structures of sentences; Bowerman (1973) described them as "simple rules of word order"; and Braine (1976) described rules of "word position." In the final analysis, then, 'semantic theories' have described the surface structure of children's sentences in terms of syntax--with such syntactic learning dependent upon prior semantic learning. As Bowerman now states, "Insofar as constraints on word order are by definition treated by that part of linguistic description called syntax, knowledge of word order must be called syntactic knowledge. However, there is more to syntax than word order" (1975, p. 85). It is certainly true that there is more to syntax than word order given that language development proceeds vertically--with progressive transformations of knowledge that expand the notion of syntax--as well as horizontally to include both semantics and syntax in the acquisition of grammar.

Knowledge of subject and predicate in children's early sentences consists of knowing (1) that semantic-syntactic categories of words are formed by word order, in addition to knowing (2) semantic relations between words and (3) word order relations between words. The sentence subject in early sentences is a category of words that occurs semantically, with different meanings in relation to different categories of verbs, but occurs syntactically before the verb. The predicate in early sentences includes categories of words that occur semantically with different meanings in relation to categories of verbs, and occur syntactically after the verb. When subject and predicate are defined in these semantic-syntactic terms, then there seems to be little question that children know something about what adults know about grammatical categories. The requirement that children demonstrate most or all of the adult knowledge (for example, Bowerman, 1973; 1974) should not be necessary in order to describe children's grammatical categories in terms of a subject/predicate relationship.

The same assumption about children's grammatical categories and the subject/predicate relation cannot be made for all children at the same time when they begin to say sentences, and this fact is probably the most serious limitation in the use of mean length of utterance as a single index of development. As pointed out in Bloom (1970, 1973) and Bloom, Lightbown and Hood (1975), the same grammatical categories are not manifested in the early sentences of all children. Three of the children described in these studies—Allison, Gia and Kathryn--presented evidence of such grammatical categories and hierarchical structure almost immediately, when they began to say sentences and mean length of utterance was less than 1.5. Two other children—Eric and Peter--began to say sentences with only linear structure at the same time, using function forms ("more," "no," etc) and pro-forms ("it," "there," "my"), to represent the same meanings, and began to learn such grammatical categories and hierarchical structure only as the mean length of their utterances approached 2.0 morphemes. Still other children as described, for example, by R. Clark (1974) seem to take a more global approach, and their first sentences consist of wholly learned, stereotyped phrases.

The importance of hierarchical structure lies in the fact that the child has learned to combine words with a semantic relation between them, where the semantic relation is not the same as the meaning of one of the words. That is, the child has learned to use word order (syntax) in order to code semantic relations that are not already represented by an individual lexical item. Such hierarchical structure is evidence that children know that categories of words are formed by word order. Thus, the verb relations with preceding nouns (sentence-subject) and verb relations with succeeding nouns (sentence-predicate) are parts of a larger superordinate structure (subject/predicate) rather than being separate formulae that are learned separately from one another as was suggested by Bowerman (1974) and Braine (1976). The claim is, quite simply, that when the semantic relations agent-action, action-object, agent-object occur in early two-word sentences, with different categories of verbs, then the child knows the fuller constituent structure agent-action-object (in semantic terms) and subject-verb-complement (in syntactic terms), with semantics and syntax being inseparable.

To conclude, language development is synergistic, not simply additive, and proceeds vertically, with transformations of linguistic knowledge, in addition to new knowledge, as well as horizontally, with multiple aspects of the language system involved together in what the child knows and is learning. As a result, what the child knows at any one time is never absolute, but, rather, varies as a function of the interactions within the linguistic system and the interactions between the child and the context.

Child Language is Variable, Not Categorical

A categorical model of language development follows from an assumption that when a child uses a word or structure, or responds to the word or structure, then he 'knows' the word or structure. However, there are indefinitely many tasks and situations in which children hear and need to speak, and the demands of such tasks and situations vary in fundamental ways. To begin with, there are important differences between understanding

a linguistic form and using a linguistic form (Bloom, 1974; Huttenlocher, 1974), and such differences are complicated further by the extent to which information from the context is available to support the understanding and use of linguistic forms. At a minimum, there are critically important differences among the situations in which what the child says, or what the child hears, maps onto an event in the observable context, or demands a mental representation of message meaning, in the absence of an event in the context, or relates to information that is contained in a prior message from someone else (Bloom, 1974). Thus, 'knowing' a word, or a sign, or a grammatical structure is not the same in different contexts regardless of use. Rather, there are a number of co-occurring variables that influence a child's language behavior.

Included among the variables that influence language behavior are factors related to the child's knowledge of language itself. It is fairly clear that acquisition does not proceed in a straight line of neatly graduated steps. Rather, there are frequent backward steps, hesitations and plateaus--as demonstrated perhaps most obviously by the variable length of children's sentences. The first sentences in early child speech are typically two words long, and sentences get longer with development. However, it is well known that two word sentences continue to occur in child speech long after the early limitation of two-word sentences is passed, mean length of utterance approaches 3.0, and the full constituent structure of a sentence (subject-verb-complement) is frequent (see Brown, 1973, and Bloom, Miller and Hood, 1975). The variable length of children's sentences has generally been explained in terms of the distinction between competence and performance, and there are two current views of the competence/performance distinction. As traditionally defined, competence consists of a speaker's knowledge of language in the form of categorial rules for generating sentences. The actual production and comprehension of speech (performance) is a reflection of competence as it is influenced by extralinguistic factors such as fatigue and distraction (Chomsky, 1965).

There has been a revision of the traditional competence/performance distinction in the proposals for the formalization of linguistic data introduced by Labov in (1969) and expanded upon since then by Cedergren and Sankoff (1974). According to Labov's model, there is systematic variation among linguistic elements, and such systematic variation is part of competence--a speaker's knowledge of language includes both categorical rules and variable rules, and variable rules are those that operate with different probabilities in different linguistic environments. The question of which of the two views of competence and performance best accounts for the variable length of child sentences was taken up in a study of the sentences with locative action and transitive action verbs in the speech of Eric, Gia, Kathryn and Peter, during the time when the mean length of their utterances progressed from ~1.0 to ~3.0 morphemes (Bloom, Miller & Hood, 1975).

The linguistic influences on the variable length of child sentences present an opportunity for exploring for intersection of the components of form, content, and use in language development. It is possible to identify at least the following three co-occurring variables: knowledge of the lexicon, or how well a child knows a word, and how much the child

knows about a word; grammatical complexity, or the addition and insertion of other linguistic forms in the constituent structure (subject-verb-complement) of a sentence; and discourse, or the effect of other speech from the child, or other speakers in the context, on what the child says. The lexicon and complexity variables represent the intersection of form and content, the discourse variable adds the dimension of use. In addition, there is always some measure of residual variation, a performance factor (Labov, 1969) that includes everything else, including systematic nonlinguistic effects from the context as well as non-systematic or 'free' variation. At least these four factors--the lexicon, grammatical complexity and discourse variables, and residual variation--intersect with one another to affect children's language behavior in important ways.

To begin with, each of these factors can have a different effect on what a child says and on what the child understands. The effect of each of the variables could operate in two directions: either to constrain or to facilitate language behavior. A facilitating effect would make it easy for language behaviors to occur; a constraining effect would make language behaviors difficult.

Given that language development proceeds vertically, with different levels of knowing the forms, meanings and uses of language, it is apparent that how much the child knows will influence what the child does. If an aspect of language is newly acquired or tentatively acquired or only partially acquired, then using it to say something or to need to understand it when someone else says something can constrain behavior, that is, make it difficult to say something or to understand. At the same time, when one or another aspect of language is familiar, well known and firmly established in the child's knowledge, then it can make it easier for the child to say something or understand when someone else says something. And, further, given that language development proceeds horizontally, with different aspects of the system learned together, it becomes apparent that there are different sources for the facilitation and constraining effects that influence the child's language behavior at the same time: in particular, the co-occurring lexicon, discourse and grammatical complexity variables. These are the variables that will be discussed here in relation to their effect on the changing length of children's sentences--the use of sentences with two, three or four constituents. Three constituents were theoretically possible with transitive action verbs, that is, subject-verb-object complement, and with Mover- and Patient-locative action verbs, that is, subject-verb-place complement; four constituents were theoretically possible with Agent-locative action verbs, that is, subject-verb-object and place complement.

Lexical Variation

A reasonable assumption about lexical acquisition is that the words a child knows best are those that have been used for a relatively long time, and used often. Given this basic assumption, knowledge of words (in particular, verbs, nouns, and pronouns) covaried with length of sentences in the speech of the four children--Eric, Gia, Kathryn and Peter. With respect to verbs, in terms of the ratio of the number of different verbs to the number of utterances, the children used more different verbs with two-constituents sentences than with three and four constituents. That is,

when the children did produce the full constituent structure, sb-vb-complement, they tended to use a relatively small number of verbs, and to use those verbs frequently. When verbs were classified as "old" because they had already occurred in an earlier observation, or "new" because they had not been observed in any previous sample of a child's speech, a comparison of old and new verbs in two and three constituent sentences revealed significantly more new verbs in two constituent sentences, than in longer sentences (see Bloom, Miller & Hood, 1975).

With respect to nouns and pronouns, a different comparison was possible. In the earliest sentences of two of the children, Peter and Eric, constituent relations were predominantly coded with pronouns in relation to verbs, and in the earliest sentences of Gia and Kathryn, constituent relations were predominantly coded with nouns in relation to verbs. When mean length of utterance approached 2.0, there was a shift for the four children--Peter and Eric began to use nouns (as object and place primarily) while Gia and Kathryn began to use pronouns (Bloom, Lightbown & Hood, 1975). When the relative occurrence of nouns and pronouns was observed in relation to sentence length, and effect of the shift from nouns to pronouns or from pronouns to nouns was observed on sentence length with three of the children. At the time of the nominal/pronominal shift, nouns, which were the more recent acquisition for Peter and Eric than pronouns, occurred more often in two-constituent sentences than with three-constituents. Similarly, pronouns, which were the more recent acquisition for Gia, occurred more often in her two-constituent sentences than in three constituent sentences. After the shift, when the four children produced sentences with three or four constituents, pronouns were used more frequently than nouns. Thus, just as there were more different verbs with two constituents, there was also greater variability in the agent, object and place constituents (the ratio of different forms to the number of utterances) with two constituents than with longer utterances.

In sum, the children used more different words and more recently acquired words in shorter sentences than in longer sentences. One could conclude, then, that how well and how much of a word a child knew, influenced how long a sentence he could say--words that were well known, and used for a long time, facilitated the occurrence of the full constituent structure, while words that were more recently acquired and less well-known (that is, in terms of their lexical meaning as well as in terms of their syntactic meaning) constrained the full constituent structure.

Discourse Variation

Just as with the lexicon, there were factors in discourse--the occurrence of a child utterance in relation to the larger linguistic context that included other utterances from the child or from others--that either facilitated or constrained the length of sentences. When successive child utterances were compared, a sentence with three or four constituents was more often a formal expansion of a previous utterance than was a sentence with two constituents (in that it shared the same words and/or structure). Often, the adult in the context 'prompted' the child by repeating part of the child's first utterance, or asking "What?" or "Huh?", and then the longer sentence occurred. Thus it appeared that longer sentences were

facilitated when the child had already said a part of the sentence and/or when the adult provided some kind of 'prompt' for a continuation or repetition (see Bloom, Miller & Hood, 1975).

Other evidence from a study of adult-child discourse (Bloom, Rocissano & hood, 1976) indicated that the situation in which the child is expected to respond to a statement or a question from someone else is a different state of affairs from the situation in which the child's utterance originates with his own idea and intention to speak. Child utterances that are contingent upon prior adult utterances (in that they share the same topic and add new information) are, in general, somewhat shorter than spontaneous utterances. Of greater importance, however, is that contingent speech is far less frequent in the period from 20 to 26 months than is spontaneous speech, or speech that follows after a prior adult utterance but does not share the same topic. Also, although the children produced questions spontaneously when MLU was between 2.0 and 3.0 morphemes, they did not ask questions that were contingent on a prior utterance at the same time. Thus, even though children might choose to change the topic of conversation, it appears to be more difficult for the child to use the information in a prior message from someone else to form a related sentence, than to use information from his own thinking and with his own motivations to speak. In sum, different factors in discourse operated to both facilitate and constrain the children's language behavior.

One might suspect that variation in utterance length is the consequence of grammatical ellipsis in discourse--that is, the children could be taking into account prior linguistic reference by themselves, and others, and eliminating redundant elements in their own speech. If the proportion of the children's utterances that were contingent on a prior adult utterance was greater with two-constituent sentences than with longer sentences, then one might conclude that ellipsis accounted for the two-constituent sentences that continued to occur. However, although the proportion of contingency increased developmentally for the four children from the age of 20 to 36 months, the frequency of contingency was not different in two- and three-constituent sentences. Moreover, ellipsis has to do with the elimination of redundant elements, but contingency very often included redundancy as there was a strong tendency for the children to repeat some part of the prior utterance at the same time that they added something to it. It was concluded that, as suggested also by Brown (1973), grammatical ellipsis, at least as it operates in adult speech, was not yet productive in the children's speech and could not be a factor accounting for the variable length of utterances.

Grammatical Complexity

There are two changes in children's sentences after mean length of utterance passes 2.0: first, children begin to use the grammatical morphemes that signal such meanings of plurality, time, aspect, etc., and second, other semantic-syntactic relations such as possession, attribution and negation are increasingly combined with the basic sentence relations subject-verb-complement. How do these changes affect how much of the basic sentence the child is able to say?

When the frequency of any and all additions to an individual constituent, or insertions between constituents in sentences, was compared in two-constituent and three- and four-constituent sentences, such added complexity in general occurred more often with shorter sentences (with only two constituents) than with longer sentences. However, when the kinds of complexity were compared separately, it was observed that different kinds of complexity had different effects on utterance length. On the one hand, negation and two-part verbs, as well as the inclusion of other relations of possession, recurrence and attribution that separated constituents, occurred more often with two-constituent relations than with three-constituent relations. On the other hand, any complexity within an individual constituent, that is, verb inflections, prepositions, noun inflections and determiners, did not affect sentence length, and occurred as often with longer sentences as with shorter sentences (as reported, also, by Cazden, 1968). Thus, complexity, per se, was never a facilitating factor; certain kinds of complexity had no apparent systematic effect on the rest of a sentence, but certain other kinds of complexity did constrain the length of sentences. A more detailed account of these analyses of lexical, discourse, and grammatical complexity variation is reported in Bloom, Miller & Hood (1975).

In summary, child language is variable, rather than categorical. Lexical, discourse and grammatical learning influence what children are able to say with different effects: either to facilitate sentences, that is, to increase the probability of realizing one or another constituent relation, or to constrain or reduce the probability of realizing one or another constituent relation.

Only certain complexity was a constraining factor. For example, negation, two-part verbs, and embedded relations occurred significantly more often with two constituent relations than with three constituent relations. Discourse was a facilitating factor in that three constituents occurred significantly more often in context with a previous two constituent utterance by the child or a contingent prompt or query from an adult, or a constraining factor when the child utterance originated with a prior adult utterance. Lexical knowledge was either a constraining or facilitating factor--old words occurred more often in three and four constituent (subject-verb-complement) relations, while new words occurred more often with two constituent relations.

More important, however, than the separate facilitating or constraining effect of one of the other variable was the fact that they were co-variables, and operated at the same time--along with other possible systematic variables that are, as yet, unidentified--to influence the children's language behavior. As can be seen, any one effect can occur in single combination with any one other effect, or in multiple combinations with more than one other effect. In a situation in which the child uses a relatively new word, that he has heard in few contexts and used only rarely before, one can expect that he will have greater or lesser difficulty in using the word according to whether there is support for what he says from the context, and how well he knows the other words and the structure in the sentence. Similarly, one can expect that language behavior would be easiest for the child when he is using well known words, well established

rules of grammar and has already said part of the sentence and received a prompt from his listener for more of the sentence.

The variable lengths of a child's sentences, then, appear to be due to the covariance in different aspects of what the child knows about language. Knowledge of language, or competence, in this early stage in the acquisition of grammar, is variable, rather than categorical. The variability that has been described has several dimensions. One is the dimension of how well a child knows a particular aspect of language at any one time, which is related, in turn, to the dimension of developmental variability, and the way in which what the child knows changes over time (vertical development). There is also the multilateral dimension of how different aspects of what the child knows intersect with one another (horizontal development), and the interplay among different influences that are, alternatively, complementary and conflicting. It is this about child language that presents the greatest challenge--not only for the observer who seeks to study child language, but, far more important, for the child who seeks to learn language. All of which is to say that language development is considerably more complex than any theory that tries to 'explain' child language purely in terms of only syntax or only semantics or only pragmatics would allow.

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